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Translational Mobility of Components and Structure of Water–Ethanol Solutions

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Abstract The concentration dependences of self-diffusion coefficients of water and ethanol molecules in water–ethanol solutions are obtained by the method of nuclear magnetic resonance spectroscopy with the pulse magnetic field gradient. On the basis of the ideas of hydration of ethanol molecules, the obtained dependences are interpreted and assumptions are made about the structural organization of water–ethanol solutions in the region of diluted and concentrated solutions.

1 Introduction

It is difficult to argue that starting a study of any molecular systems, in which water is one of the main components, the system under investigation will behave in a manner different from the manner assumed on the basis of the vast amount of previous knowledge about the properties of similar systems. In the attempt to use the approaches we applied during the study of the water solutions of glycols and saccharides, these approaches were not effective when applied to water solutions containing ethanol as a component.

To solve these problems, we undertook a special study of the ethanol solutions. We realized that water–ethanol solutions were investigated many times in different aspects and a vast amount of experimental results about the properties of these solutions was accumulated. A comparative analysis of physicochemical, thermodynamic properties of different water–alcohol mixtures including also water–ethanol solutions and their anomalies was carried out in a fundamental work [1]. More detailed information on the structure of ethanol solutions and molecular

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